Industrial Technologies Program

Low Cost Chemical Feedstocks Using An Improved And Energy Efficient Natural Gas Liquid Removal Process

Development of a New, Low-Cost NGL Recovery Process Could Decrease the Cost of Chemical Feedstocks

Natural Gas Liquid (NGL) is a collective term for the mixtures of ethane, propane, butane, and natural gasoline extracted from natural gas. The economic values of the separated NGL components, when sold as chemical feedstocks, are usually much higher than their value as fuel. Moreover, in the last decade, the demand for NGLs as chemical feedstocks significantly increased in North America and is expected to continue growing provided that adequate economic supplies are available to petrochemical producers. The United States is the largest NGL producer in the world, with a production capacity of 1.9 million barrels per day (bpd) in 2002, and a value of over $10 billion at the average spot market price.

Conventional NGL recovery technologies, such as cryogenic turbo-expanders, are highly energy intensive, requiring substantial energy to recompress the processed gas back to the pipeline pressure. The Gas Technology Institute will lead a team composed of Green Hi-Tek, Oak Ridge National Laboratory, the Illinois Institute of Technology, Duke Energy Field Services, and Halliburton/Kellogg, Brown and Root in developing a new, low-cost, and much more energy-efficient NGL recovery process. The technology has the potential to save up to 200 trillion Btu per year by 2020, reducing the cost of NGL separation from natural gas

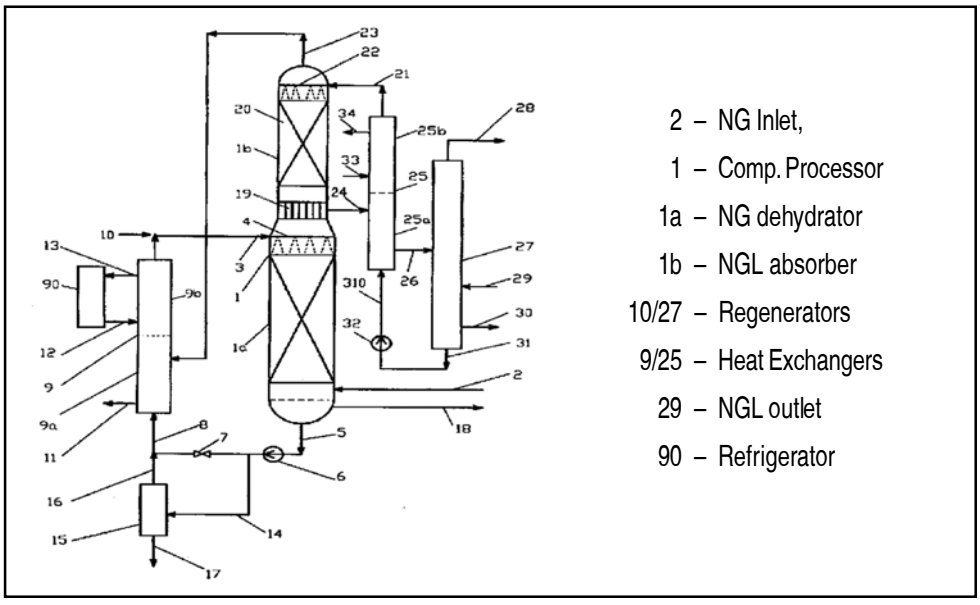

Fig. 1: Schematic of the New Energy Efficient NGL Recovery Process.

Benefits

By 2020:

- *Energy savings up to 200 trillion Btu per year*
- *NOx emissions reduction of up to 48 million pounds per year*
- *SOx emissions reduction of up to 26 million pounds per year*

Applications

The technology will benefit natural gas liquid recovery practices and also chemical industries involved in gas-liquid separation and distillation under similar operating conditions. Because of its compact size, the new technology can be practical for offshore platform applications.

Project Partners

- *Gas Technology Institute*
- *Green Hi-Tek*
- *Oak Ridge National Laboratory*
- *Illinois Institute of Technology*
- *Duke Energy Field Services*
- *Halliburton / Kellogg, Brown and Root*

and providing cheaper feedstocks to the chemical and petrochemical industries. Because the new process works under constant pressure without any significant pressure loss, no recompression of the residue gas is required, resulting in substantial energy and capital cost savings.

Project Description

Goal: The overall goal of this project is to develop a new low-cost and energy efficient NGL recovery process - through a combination of theoretical, bench-scale, and pilot-scale testing - so that it can be offered to the natural gas industry for commercialization.

In the new process, the separation of trace water vapor and the recovery of NGL are both carried out at a refrigeration temperature of -40F, which is much easier and economical to obtain, compared to -150F required for conventional cryogenic NGL recovery technologies. Additionally, pressure drops in the new technology are almost negligible unlike typical 500-600 psi pressure drops observed during gas expansion in the cryogenic recovery process.

Activities: The project involves two phases. The first phase consists of the examination of fundamental data critical to the development and evaluation of the technology for NGL separations. Extensive laboratory experiments will be conducted to select suitable solvents for dehydration and NGL absorption to deploy the process and study the effects of important parameters of NGL recovery and solvent regeneration. The second phase will be focused on designing, constructing, and operating a pilot-scale unit to demonstrate its long-term operation under field conditions. Critical R&D issues related to the development of the new process, market studies, process economics, and commercialization paths will also be studied during the second phase.

Progress and Milestones

Phase I will be concluded in 6 to 12 months. After Phase I is successfully completed and the technology passes a go/no-go decision, Phase II will begin.

The project milestones are summarized below:

- Preliminary computer simulation model is developed, and initial technical verification of the process completed
- Design and construction of the bench-scale unit completed
- Bench-scale tests are completed, and computer simulation model updated
- Construction of pilot-scale unit is completed
- Field-tests completed, process design verified, and computer simulation model updated
- Final computer simulation model completed
- Engineering and commercialization package is completed

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